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10/019,812	05/22/2002	Alexander Fischer	20496-309	8628

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Charles Gutman
Proskauer Rose
1585 Broadway
New York, NY 10036

EXAMINER
PADGETT, MARIANNE L

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 07/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Files copy

Office Action Summary

Application No.	Applicant(s)	
10/019,812	Fischer et al	
Examiner		Group Art Unit
M. L. Padgett		1762

—The MAILING DATE of this communication appears on th cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☐ Responsive to communication(s) filed on 8/13/02, 5/22/02 + ~~8~~.

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-21 is/are pending in the application.

Of the above claim(s) ___ is/are withdrawn from consideration.

☐ Claim(s) ___ is/are allowed.

☒ Claim(s) 1-21 is/are rejected.

☐ Claim(s) ___ is/are objected to.

☐ Claim(s) ___ are subject to restriction or election requirement

Application Papers

☐ The proposed drawing correction, filed on ___ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on ___ is/are objected to by the Examiner

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. § 119 (a)-(d)

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).

☒ All ☐ Some* ☐ None of the:

☐ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. ___.

☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: ___.

Attachment(s)

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 3, 8

☒ Notice of Reference(s) Cited, PTO-892

☐ Notice of Draftsperson's Pat nt Drawing R view, PTO-948

☐ Int rview Summary, PTO-413

☐ Notice of Informal Pat nt Application, PTO-152

☐ Other ___

Office Action Summary

U.S. Patent and Trademark Office
PTO-326 (Rev. 11/00)

Part of Paper No. 9

*U.S. GPO: 2000-472-999/43204

1. Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In lines 6-7 "a hard-material or alloy powder" is introduced, but is ambiguous because it could be read as the alternative being between the material and the powder, or as between two types of powders. Later limitations to "the hard material power" in 1(b), 1(c), 1(e) indicate the later is probably intended, except, the alloy powder is not used in any of these steps, so either the process need not employ the steps that use the hard material powder, if the alloy powder is chosen, or the relationship of the alloy powder to the claims is unclear.

Also note in the first 3 lines of claim 1, the alternative phrase recited there also contains ambiguities; i.e., does "a surface-alloyed" only go with the initial "cylindrical" or also with "partly..." and "hollow...", since the adjective form cylindrical is used, "member" can at least be said to go with all 3 shape descriptions, but as written the member being treated is not necessarily or unambiguously surface alloyed. Furthermore, there is no necessary connection between the preamble's "structural member" and "a workpiece surface" which is actually processed, so the preamble and the claimed steps are not commensurate in scope.

Use of relative terms, that lack clearly defined metes and bounds in the claims, or in a definition in the original specification or in cited relevant prior art, is vague and indefinite. In the claims, see "hard" in "hard-material"; "immediately" in 1(c); and "uniformly" in 1(e) and 1(f). In the later two, the circumstances may help define, but "hard material" is more subjective. Note a range of values defines "high cooling ratios" in 1(f).

In part c) of claim 1, is "an energy beam at wavelength..." the same beam as introduced in line 3, and used in 1(a) to form the melting bath? Or is it a different beam? The article does

not show antecedent bases, but neither is the term differentiated. Since the heating front and bath have antecedence in 1(a), the beam could refer to the already introduced one, but since a different beam could also be used to heat the powered, it also ambiguously might not. In 1(f), feed rate of what material, the work piece, the powder or what? Since mm is a unit for a linear dimension, relative movement between beam and substrate makes sense, or just substrate to somewhere, the claims do not say.

In claim 4, due to inconsistent nomenclature "the precipitation structure" has no antecedent basis.

In claim 8, what is a "downhand position"? Note "the coating" lacks antecedent basis due to inconsistent nomenclature. Is the phrasing for the workpiece-beam configuration as intended? If the hollow cylinder is rotating "about the…beam", how can the beam form a linear focus, i.e. linear beam spot on the work piece/cylinder? The claim is too unclear to be treatable over art as written. Perhaps this is a translation problem. The actual energy beam is a different quantity then the beam spot or focal point that the beam forms on a substrate. The wording in claim 9, would appear to indicate that the claim language is mixing of the term for the beam itself, with the cross section the beam forms where it is indent on the workpiece. There is a significant procedural and configurationally difference between rotating about the beam and rotating about the beam spot ; or between the beam having "a point structure…" and the beam's focus having one. Applicant's need to carefully consider their phraseology in this respect. The examiner must treat what the claims actually say, not what she guess they might intended, but failed to actually claim. The present phrasing creates logic problems, and inconsistencies with the independent claim. The entire set of claims should be reviewed for intended meaning on this respect, to correct any inconsistencies between intent and claimed language.

Claims 14-21 have been amended to depend solely from independent claim 1, which is a method claim, but they are all device claims, and there are no device limitation in claim 1 for them to further describe, except maybe the energy beam. Consequently, they make little sense in their claimed context, and lack any antecedent basis for many of their terms. The status of these claims is so unclear, it may not be possible to usefully discuss them with respect to prior art.

In claim 12, line 1 "the method" lacks any antecedence in this independent claim, and what method is never defined in the body of the claim. The configurations described in claim 12 are also vague. Where or in what are the "index holes" (line 3) and "working surfaces" (line 4) located, and "whose surface" does not specify what surface is intended. The only previous introduction was "working surfaces" which is plural. While logic says it may be the powder and the beam on the workpiece surface, the claim does not require the supply and beam head to direct them there as presently written. Again, what "downhand" means is not clear, in either claim 12 or 13.

An "axis" is a descriptive word, and many axis can be drawn in various configurations with cylinders. How does the claimed axis related to the shape of the cylinder (which lacks antecedent basis)? Is "inserted into" intended to indicate the cylinder is hollow, with the axis running down its center lengthwise? But how would the beam focus relate to this? Claim 12 needs clarification in order to determine how claim 13's multiple beam units can be configured for staggering.

It is noted that the phrase "an energy beam having a linear radiation area" can have several meanings, such as the beam spot of the energy beam is scan in a line, so that the area irradiated is linear; or that the beam spot it self is linear which can be produced by masking or by use of a cylinder lens with a laser. This latter option agrees with what applicant's

subsequently state, i.e. "hereafter called a linear focus", which double range is now acceptable in US patent claims according to present PTO management, except narrower limitation to the focus term is used latter in the claim, so what range of meanings is intended? The phrase "herein after called" does not positively choose the focus option, (calling something by a misnomer does not change what it is), but does not indicate the intent to do so. As presently phrased, it is not clear if the claim should be read as possibly using all options read on by the broader phrasing, or the narrower option of linear focus. When a double range is claimed, either broad or narrow can be applied, with the narrower range treated as an optional limitation, but the present phrasing is ambiguous. If applicants only intend to use a linear focus, they should remove the ambiguity and explicitly claim it. For various linear radiation areas within the meaning of the claims as presently written, see Usiu (Japanese), Mori et al and Hayashi et al.

In claim 11, what aspect having to do with the hollow cylinder is treated to the claimed depth? Does this "depth" mean or indicate how deeply one has to melt the workpiece surface; or how deep into the interior of the bore one must treat; or does it mean one must deposit multiple layers until they total up to 200; or what?

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese patent to Hayashi et al.

In Hayashi et al, see the English abstract and figures, especially 1 and 3 for inserting the laser beam and powder supply into the interior of a cylindered pipe, along its longitudinal axis, where the rotation of the pipe and of the laser beam/powder conveying means cause relative linear scanning of the piper interior, where the powder after being input towards the pipe surface from nozzle 15, falls with gravity. Whether the rotation is as claimed cannot be determined, as what a "down hand" position might be, and how one can define its angle is not decipherable. Also note Fig. 2, which shows support means, which essentially keep the pipe work piece clamped in place.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al as applied to claim 12 above, and further in view of Psiuk et al or Kar et al.

Hayashi et al only employs one laser beam, however as seen in Psiuk et al (Fig. 6-7; col. 4, lines 62-68 and col. 6, lines 3-16) or Kar et al (Abstract; Fig. 9 (A-B) +11; col. 7, lines 35- col. 8, line 29), that use of successive laser beams when alloying powders to substrates has desirable advantages of protecting the substrate from excess heat loading or enabling tailoring of the laser beam intensity to control melt of powder and substrate, and create a thermal gradient for solidification, therefore it would have been obvious to one of ordinary skill in the art that the use of means to create successive energy beams to treat substrates as taught in Hayashi et al would have been advantageous therein for the same benefits, as the Hayashi et al apparatus is also intended for alloying.

5. Claims 1-2 and 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnecke in view of McCay et al, optionally considering Kurz et al or Pratt et al.

Warnecke (Abstract; Fig. 2; col. 2, lines 53- col. 3, lines 37 and 45- col. 4, line 3; and claims) teach coating the inside of gun barrels, i.e., hollow cylinders, by laser melting the inner surface, while simultaneously laser melting powder of a metal (may be called hard) introduced into the molten bath, such that the molten region contains both substrate and coating material, which solidifies as the laser moves away. Successive layers of different or the same coating materials may be applied. Thickness of a deposited layer is taught to be 0.3-1.5 mm, dependant on application mode. Particularly suggested lasers are CO_2 or Nd:YAG, which are both IR lasers, thus suggestive of wavelengths as claimed. While Warnecke does not give the detailed structure of his melt pool that applicant describes in his claims, the melt and solidification sequences described would have been expected to have been produced by such. Alternately, Kurz et al (abstract; Figures 2-3, col. 4, lines 8-53 and claims 1, 3, 5 and 7-11) or Pratt et al (abstract; Fig. 6; col. 7, lines 46- 57; col. 8, lines 32-68; and claims) provide further description of melting of coating material and its mixing with the melted substrate in order to form metallurgical bonds. The illustration in Kurz et al's Fig. 2 is especially informative, hence it would have been further obvious for one of ordinary skill to further particles at the front or start of the melt zone, so that they may adequately alloy with the substrate for the desired bonding.

Warnecke scans linearly, but does not employ a "linear focus", thus reading on the broader meaning the claims, not the narrower. Also, Warnecke does not give specific processing parameters, or use Si powder or treat cylinders of Al or Mg alloys. One of ordinary skill in the art world have determined via routine experimentation the parameters necessary to produce the desired melting and solidifying effects, which would vary according to particular substrate and coating materials.

Particular materials employed in a laser coating/alloying technique depend on the end use for which the substrate or cylinder is put. McCay et al (abstract, figures; col. 1, line 54-67; col. 2, line 8- col. 3, line 12; and claims 1-6, 8-10 and 15-18) are employing an analogous process to coat the interior of Al cylinder bores, where possible powder additives include various metals, Si, SiC, etc., to be alloyed with the substrate, hence melting of both must occur inorder to alloy. McCay et al teach use of 3KW Nd:YAG lasers, where the relative translation between beam and cylinder is 4000-9000 mm/min, with laser power density (i.e., specific power) of 50-150 KW/cm^2 (i.e. $5x10^4$- $1,5x10^5$ W/cm^2) and it is preferred to use a rectangular cross-section for the laser beam, which approaches a linear focus or linear radiation area, especially as cylindrical lens are used to achieve it. It would have been obvious to one of ordinary skill in the art that the general deposition process of Warnecke would have been applicable and effective to alloy other bores for other purpose, and that McCay's process which is also desirous of wear resistance would have been effectively done using Warnecke's powder deposition melting procedure, optionally refined by Kurz et al or Pratt et al, as the ability to effectively melt the powder and mix it with the substrate melt has been seen to be significant in creating the desired wear resistance. Parameters in McCay would have been optimized for the materials employed therein, hence would have been the expected basis or starting point for optimization of the melt/solidification of the combined references for these same materials.

While no discussion of sequences for starting or steps are discussed for when multiple layers are deposited, it would have been a matter of competent workmanship to ramp up or down the initial power and powder inputs because otherwise one would have a sharp demarcation line at the start/stop points, which would have been detrimental for any of the uses contemplated for the cylinders of the references. Since smooth inner surfaces are desired, a

gradual decrease in the last layer to leave no obvious ending seam would have been required, and desirable to minimize otherwise necessary smoothing/finishing procedures.

6. Claims 3-4 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Warnecke in view of McCay et al, optionally considering Kurz et al or Pratt et al as applied to claims 1-2 and 5-11 above, and further in view of Kar et al (discussed in section 4 above).

Kar et al provide reasons for using the claimed beam splitting proceedings, which would have been obvious to apply to the above combination for reasons as given in section 4. Also note that they teach diode lasers (Fig. 10; col. 8, lines 43-47), as well as Nd:YAG or CO_2 lasers (Figures 1-2; col. 5, lines 36-50); col. 7, lines 17-27), hence all these IR lasers are taught as effective alternatives for laser alloying processes, hence obvious as set forth above.

7. Claims 1, 3-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwartz et al, in view of Psiuk et al, optionally considering Kurz et al or Pratt et al (as applied above); and/or optionally considering Kar et al (applied in sections 4 and 6).

Schwartz et al is alloying the outer surfaces of Al pistons (i.e. cylindrical) as illustrated Figures 2-3 with a powder of metallic or ceramic components and rectangular (i.e. approximately linear) beam spots, translation range of 1500-3000 mm/min; laser power densities of 115-135 KW/cm^2 and thickness of 50-100 μm. See the summary; col. 1, lines 52-col. 2, lines 6 and 12-37; plus claims in Schwartz et al. While the illustration could be indication of introduction of the powder at the front of the laser's effects, Schwartz has no actual discussion of melting or its sequence, but the taught alloying requires that melting occurred, and the use of parameters like those claimed indicates like effects. Psiuk et al is cited for its discussion of coating cylindrical exteriors in an analogous process, but uses different material (Mo powder onto steel body) for which Psiuk et al provide significant discussion on how one should choose laser conditions to insure that powder and substrate are appropriately melted in

order to form the desired metallurgical bond (abstract; figures; col. 1, lines 65- col. 2, line 3; col. 2, line 60- and col. 3, line 37; col. 4; line 59- col. 5, line 15; plus previously cited beam splitting teachings). From Psiuk et al's teachings one of ordinary skill in the art would realize that decisions on how soon to start melting powder vs. substrate, and where to have the most intense heating for the alloying/bonding process would have been dependent on the melting points of powder and substrate materials, hence it would have been obvious to apply these concepts from Psiuk et al to the process of Schwartz et al to optimize the alloying bonding process, inorder to achieve the optimum metallurgical bond for the piston engine, for which superior wear resistance is desired. Note above reasons for obviousness of use of beam splitter, start/stop procedures as discussed above also apply here, with Kar et al supplying cumulative teaching to Psiuk et al or Kurz et al or Pratt et al, being cumulative to the combination for the melting/bonding sequence as previously discussed.

8. Other art of interest include Wallmann who has laser powder deposition cumulative to the configuration employed in Schwartz et al and Psiuk et al. Lewis has further multi-layer laser powder deposit of interest.

It is further noted that the patent to Bady et al cited in the IDS of Paper No. 8 has one overlapping inventor, but the assignees are named differently "VAW Motor GmbH, Bonn (DE)" for the patent, and "VAW Aluminum AG, Bonn" for this application, so due to the different inventive entities and apparently different Assignee's, Bady et al is prior art, as the 4/19/99 filing date is before both the PCT and German priority dates of this case. If the Assignees were the same, an obviousness double patently rejection would have been made over claims 1-2, 4-10 and 12 from the patent.

9. Claims 1-2 and 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bady et al, in view of Kurz et al or Pratt et al.

In Bady et al, see the abstract; figures, esp. 1-3; Summary (esp. col. 1, lines 46- col. 2, lines 30, 37-43 and 52- col. 3, line 15); col. 5, line 7- col. 6, line 67 for the description of apparatus shown in Fig 1-2, of the mirror in 3a-b creating the linear focus or beam spot, and col. 6 for lasers and processing parameters as claimed. While Bady talks about alloying and melting and cooling, they do not give the detailed mechanistic description of how or where the particles are put into the beam spot or the melt it creates, and the effects thereof, other than alloying and hard coating. As the parameters are essentially the same or significantly overlapped, the melting cooling and solidifying effects would inherently be the same for like input procedures. Kurz et al or Pratt et al discussed above provide input procedures lacking in Bady et al, discussing advantages of superior metallurgical bonds for analogous processes, hence for this reason, and reasons discussed above, input of the powder and the claimed sequence of melt/coat/solidifying effects would have been obvious and motivated. Also, multiple coating and procedures used therewith as discussed above are further obvious.

10. Claims 3-4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bady et al in view of Kurz et al or Pratt et al as applied to claims 1-2, and 5-12 above, and further in view of Kar et al as applied in sections 4, 6 and 7 above for reasons discussed therein.

11. Any inquiry concerning this communication from the examiner should be directed to M. L. Padgett whose telephone number is (703) 308-2336. The examiner can generally be reached on Monday-Friday from about 8:30 a.m. to 4:30 p.m.; and fax phone numbers are (703) 872-9310 (regular); (703) 872-9311 (after final); and (703) 305-6078 (unofficial).

M.L. Padgett/dh 7/16/03
July 21, 2003

Marianne Padgett

MARIANNE PADGETT
PRIMARY EXAMINER